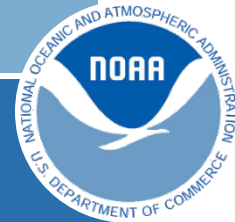


Status of NOAA Climate Strategy

Presentation Outline:

- Demand for Climate Services
- NOAA Climate Strategy
- NOAA Climate Information and Data Products
 - Current
 - Future

Wayne Higgins
Climate Prediction Center
16 November 2012



The Rising Demand for Climate Services



Commerce



Coasts



Recreation



Ecosystems



Hydropower



Farming



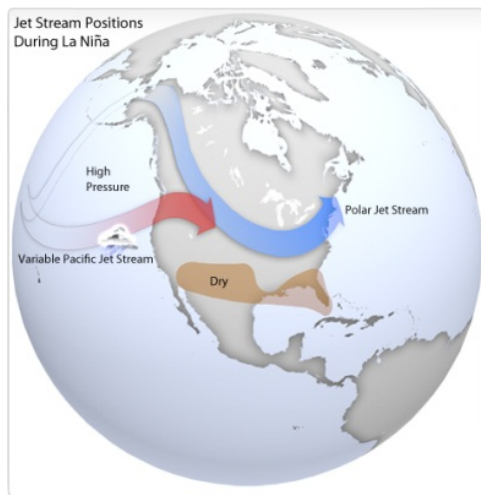
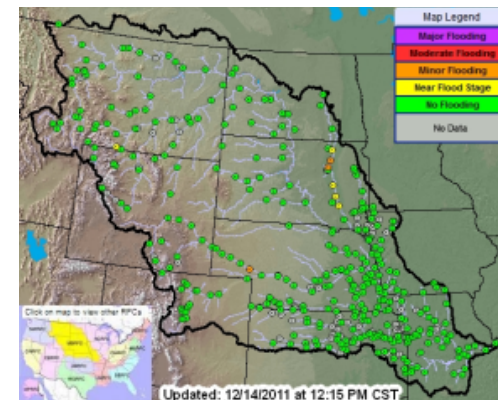
Health



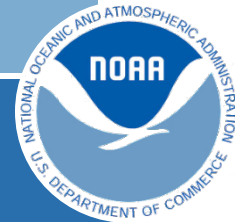
Private Sector

There is an urgent and growing need for reliable, trusted, transparent and timely climate information across all sectors of our economy.

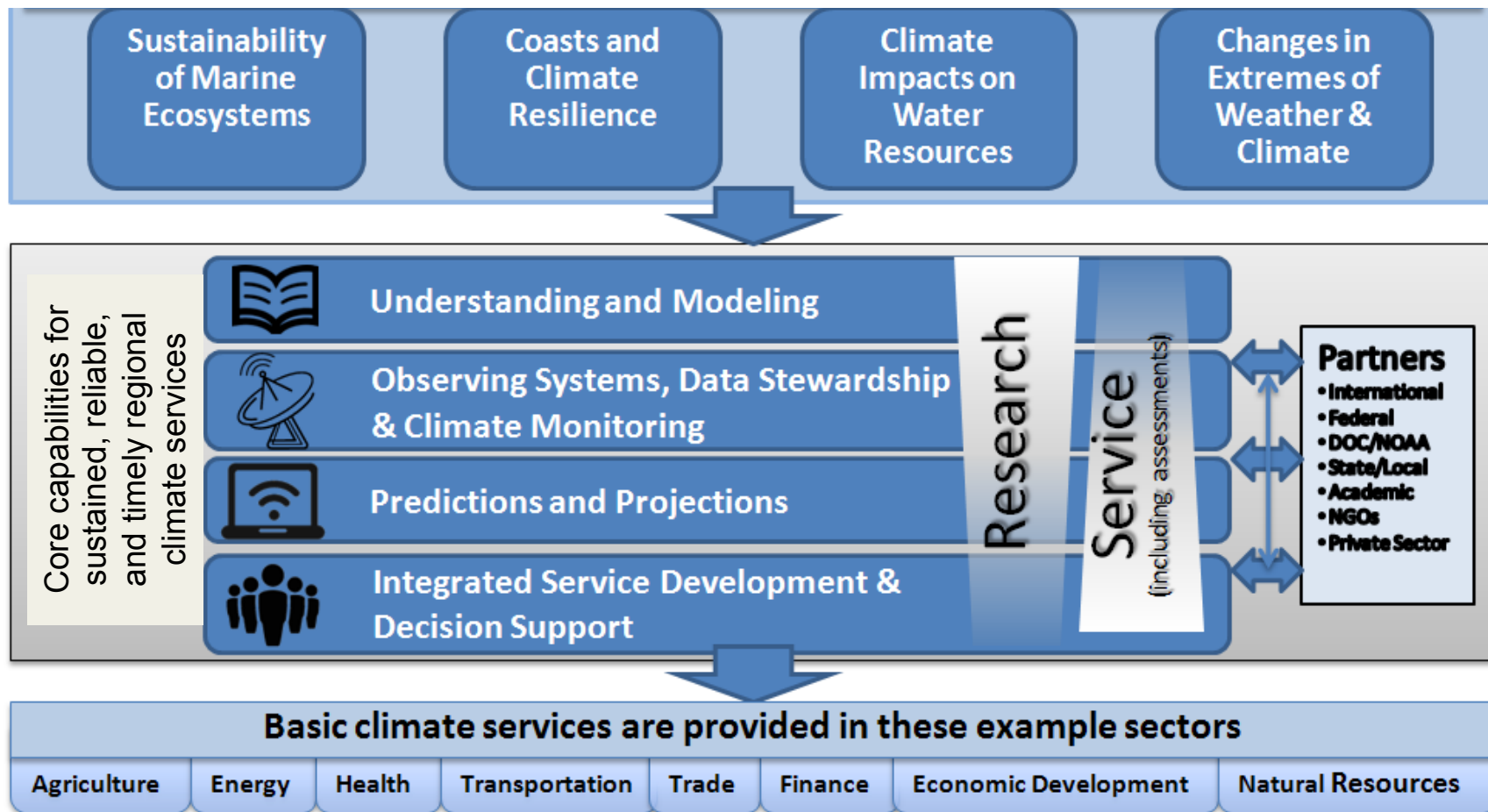
NOAA Climate Strategy: Inform Decision Making at Regional Scales

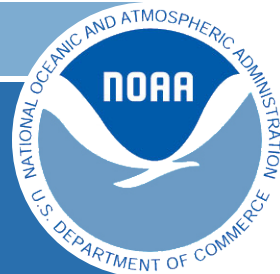


“Strengthen the production and delivery of climate information and services to inform the management of climate-related risks” NOAA AGM Sep 2012

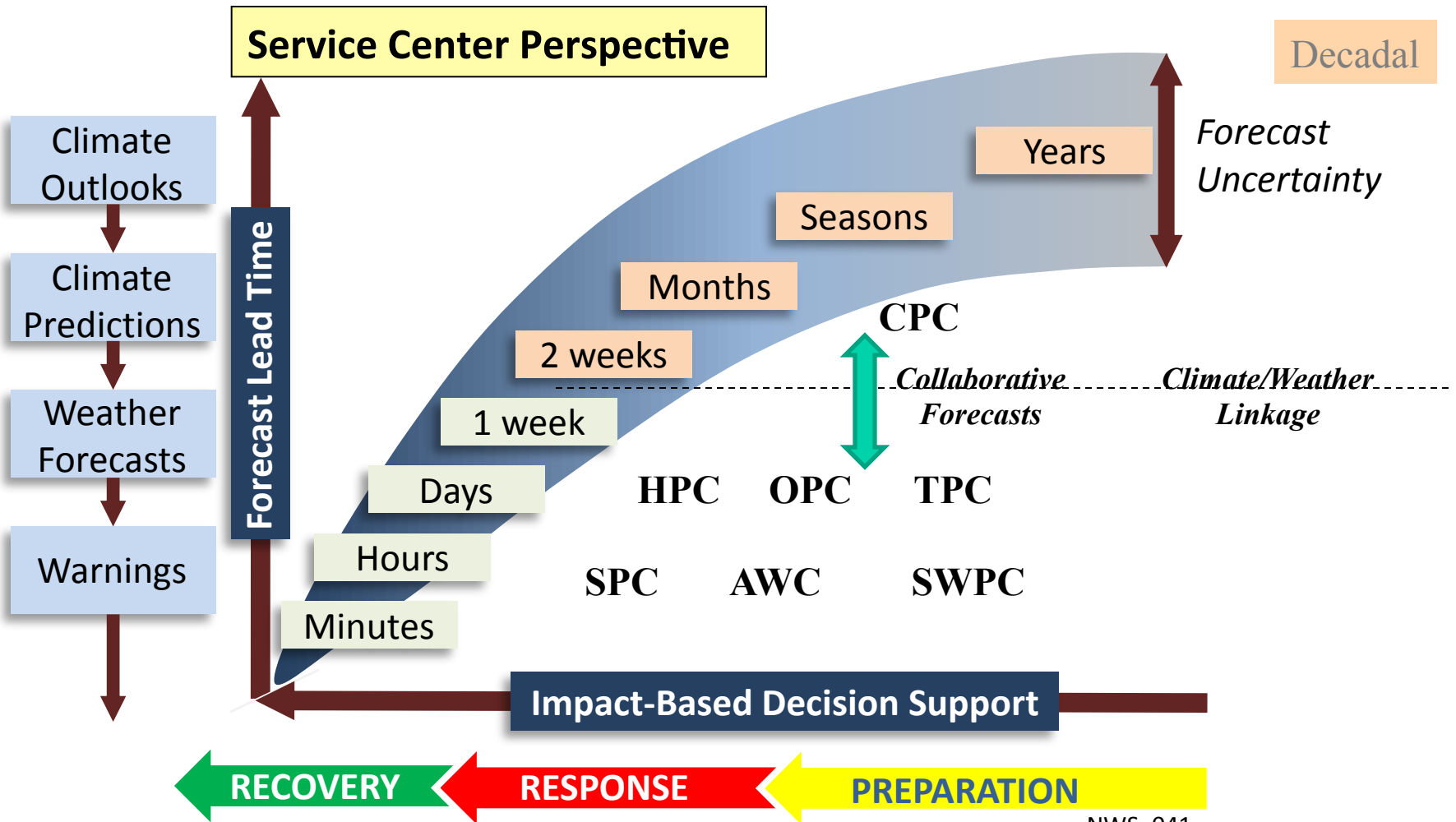


NOAA Climate Strategy: Draw on Core Capabilities to Address Societal Challenges





NOAA Forecast Products Spanning Climate and Weather



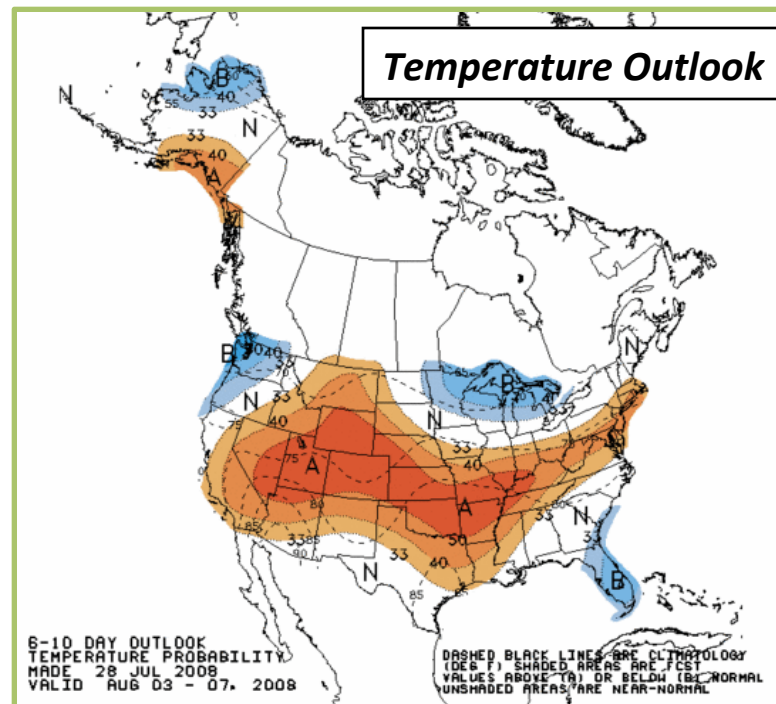
NWS_041

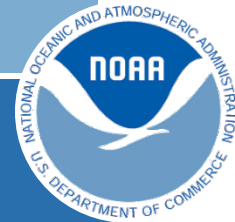
CPC Mission

We deliver climate prediction, monitoring, and diagnostic products for timescales from weeks to years to the Nation and the global community for the protection of life and property and the enhancement of the economy.

Operational Requirements:

- Deliver National outlook products: temperature, precipitation, drought, hurricanes,...
- Span weeks, months, seasons, years
- Embrace collaborative forecasting with other NCEP Service Centers, NOAA line offices, other agencies
- Ensure real-time, on-time, all the time (since '79)
- Enable NGSP Societal Challenges: "Water" and "Extremes"





CPC Example Products

Example Climate Information Products

•Outlooks

- Extended Range (6-10 day & week-2) – U.S. Temp & Precip
- Monthly and Seasonal – U.S. Temp & Precip
- Seasonal Hurricane Outlooks (Atlantic; eastern Pacific)
- Seasonal Drought Outlook
- U.S. and Global Tropics Hazards Outlooks
- El Nino / La Nina prediction

•Tools

- Dynamical Model Forecasts (e.g. GFS, CFS)
- Statistical Model Forecasts (e.g. OCN; CCA)
- National Multi-Model Ensemble

•Real-time Monitoring

- Global atmosphere, ocean and land surface conditions
- Primary modes of climate variability (e.g. El Nino / La Nina, Madden Julian Oscillation, Arctic Oscillation)
- U.S. Drought Monitor
- Monsoon Monitoring
- Storm Tracks; Blocking

•Interagency and International

- Joint Agriculture Weather Facility (Weekly Weather and Crop Bulletin)
- International Training Desks (Weekly Climate Risk Bulletins)

•Climate Diagnostics and Discussions

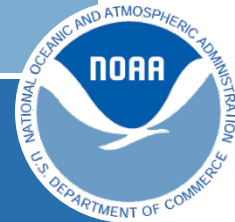
- Monthly Climate Diagnostics Bulletin
- Monthly ENSO Diagnostics Discussion

Example Climate Data Products

- Surface-Based Analyses
 - Daily Precipitation (U.S. & Global)
 - Daily Temperature (U.S. & Global)
 - Daily Heating/Cooling Degree Days
 - Monthly Snow Cover
- Model Data
 - CFS Reanalysis and Reforecasts
 - Official Outlooks and Verification
- Satellite Data
 - Daily GOES Precipitation Index
 - Daily and Monthly OLR
 - Daily Sea Surface Temperature
 - Daily satellite gauge merge (precipitation)
- Climate Variability Indices
 - Oceanic Nino Index
 - Southern Oscillation Index
 - Teleconnection Indices
 - Palmer Drought Index
- International Desks
 - FEWS-NET

Web Page: www.cpc.ncep.noaa.gov

Point of Contact: Wayne Higgins



NCDC Example Products

Example Climate Information Products

•Tools

- Climate Data Online – GIS-based map interface
- Weather and Climate Toolkit
- Climate at a Glance (U.S. and Global)

•Climate of the U.S.

- U.S. Climate Normals
- U.S. Wind Climatology
- Climate Atlas of the U.S.

•Monitoring

- Monthly Climate Highlights (U.S. and Global)
- U.S. Billion-dollar Disasters
- Drought Portal (U.S., North American, Global)

•Extreme Events

- U.S. Records
- Climate Extremes Index, Regional Snowfall Index
- Annual BAMS Explaining Extremes Report

•Statistical Information

- Temperature, Precipitation & Drought time series, rankings, maps

•Regional & Sectoral

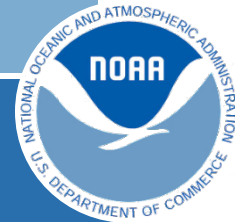
- Residential Energy Demand Temperature Index
- Regional Climate Services

•Assessments

- International (IPCC)
- National Climate Assessment
- Annual BAMS State of the Climate Report

Example Climate Data Products

- Climate Data Records
- Surface-Based Station Data
 - Local U.S. Climatological Data
 - Global Historical Climate Network-Daily
 - U.S. Climate Reference Network
 - National Solar Radiation Database
- Satellite Data
 - Geostationary, Polar-orbiting
- Radar Data
 - NEXRAD, Dual-Polarized
- Model Data
 - Reanalysis, Numerical Weather Prediction, Climate Prediction (CMIP5)
- Weather Balloon Data
 - Integrated Global Radiosonde Archive
- Marine/Ocean Data
 - Multiple global data sets
- Paleoclimate Data
 - Derived from multiple sources
- Severe Weather
 - Storm Events Database, International Best Hurricane Track Archive for Climate Stewardship



Coastal Services Center (CSC)

Top Products and Services

Example Climate Information Products

- Tools
 - Sea Level Rise and Coastal Flood Frequency Viewer
 - Coastal County Snapshots
 - CanVis Visualization Tool
 - Habitat Priority Planner
- Training and Technical Assistance
 - Coastal Adaptation for Coastal Communities
 - Coastal Inundation Mapping
 - Planning for Climate Change
 - Roadmap for Adapting to Coastal Risk
 - Coastal Community Planning and Development
- Publications
 - Marshes on the Move
 - Incorporating Sea Level Change Scenarios at the Local Level
 - Coastal Inundation Mapping Guidebook
 - Understanding Risk Behavior
 - Local Strategies for Addressing Climate Change

Example Climate Data Products

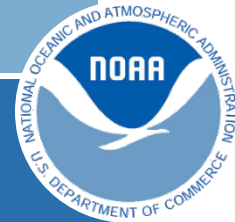
- Elevation Data
 - Topographic and Bathymetric Data Inventory
 - Coastal Lidar Data
- Land Cover Data
 - C-CAP High Resolution and Regional Data
- Data and Information Suites
 - Coastal Climate Adaptation Website
 - Coastal Inundation Toolkit

Point of Contact: Margaret Davidson

For more information:

<http://csc.noaa.gov/>

<http://csc.noaa.gov/digitalcoast/>



National Marine Fisheries Service (NMFS)

Top Products and Services

1. Monitoring and Assessment of Climate Impacts on Marine Ecosystems

Regional long-term monitoring of ocean physical, chemical and biological conditions for fisheries management, protected species recovery, and habitat conservation.

3. Increased Understanding of Climate Impacts on Marine Ecosystems

Regional research programs to understand impacts of climate variability and change on marine ecosystems, managed resources, habitats and dependent communities.

5. Projections of Climate-related Impacts on Marine Ecosystems and Resource-Dependent Communities

Research and modeling to understand future climate-related impacts on marine ecosystems, managed resources and habitats.

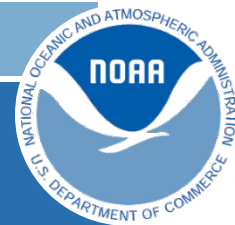
8. Management Actions to Reduce Impacts and Increase Resilience

Management actions (e.g., fishery management plans, protected species recovery plans, habitat conservation efforts) to reduce impacts, increase resilience and sustain marine resources and the communities that depend on them in a changing climate.

Web site: www.nmfs.noaa.gov

Point of Contact: Roger Griffis (Roger.Griffis@noaa.gov)



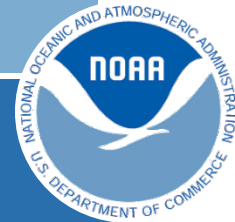


Climate Program Office (CPO) Top Products and Services

- 1. Observations and Monitoring:** Develops and sustains global *in situ* climate observing systems; Supports >50% of the sustained Global Ocean Observing System; Supports projects that produce datasets essential to international and national climate assessments; Annual *State of the Climate* Report
- 2. Understanding and Modeling:** Over 700 published papers/yr citing CPO support, contributing to growing understanding of climate variability and change; Improved operational systems through CPO-supported research; Field campaigns
- 3. Informing Decisions:** National Integrated Drought Information System (Drought.gov & pilot drought early warning systems); Regional Integrated Sciences and Assessments; Climate training workshops and reports directed to needs of resource managers; Fund National Research Council reports, including *America's Climate Choices*; Provide scientific input, coordination, funding, and sustained engagement for the National Climate Assessment
- 4. Program Development:** Implementation plan for all NOAA climate activities; 176 NOAA Climate and Global Change Postdoctoral Fellows, 35 AMS Graduate Fellows, and 9 Post Docs Applying Climate Expertise (PACE) since inception of programs; New programs (e.g., National Climate Predictions and Projections platform, Deep Argo, Coastal and Ocean Climate Applications)

Web Page: www.cpo.noaa.gov

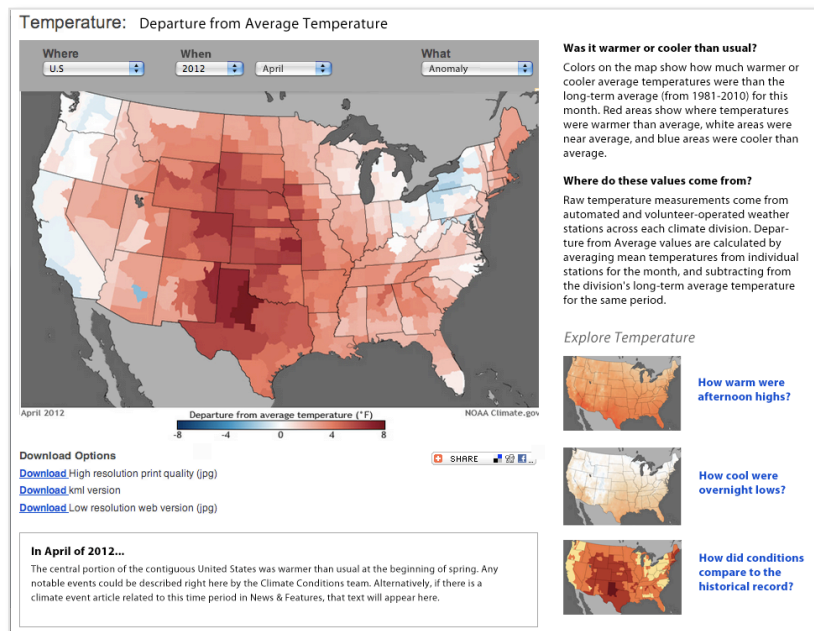
Point of Contact: Rick Rosen (rick.rosen@noaa.gov)



Climate Program Office (CPO) Top Products and Services

5. NOAA Climate.gov Portal: A public-friendly point-of-entry into NOAA's and partners' diverse offerings of climate data and information. We promote public understanding of climate science and the current state of the climate system to enhance public decision-making.

We offer four audience-focused sections with four objectives: **ClimateWatch Magazine** to inform and 'edutain' the climate-interested public; **Data & Services** to simplify discoverability and access to data products; **Education** to help teachers integrate climate science into learning venues; and **Understanding Climate** to provide policy leaders and decision makers with authoritative information resources to help them understand & manage climate-related risks.

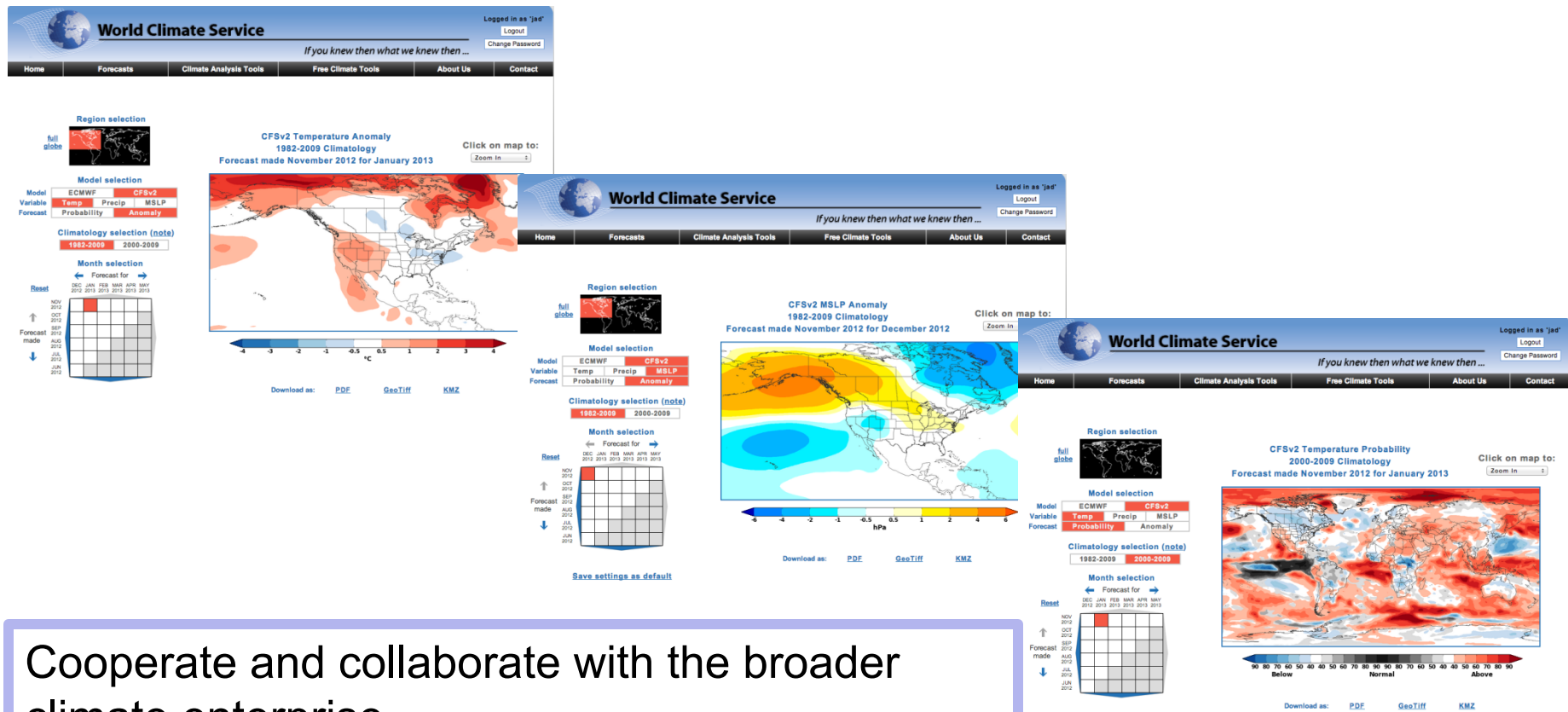


New NOAA
Climate.gov portal
interface design
(left) and Climate
Conditions concept
(right)

Web Page: www.cpo.noaa.gov

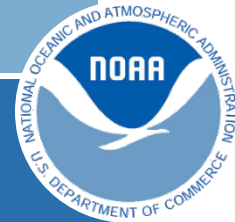
Point of Contact: Rick Rosen (rick.rosen@noaa.gov)

Leverage the Climate Enterprise



Cooperate and collaborate with the broader climate enterprise

- Seek to better understand the broader climate enterprise
- Identify data and services that can enhance public value when delivered through enterprise partners
- Ex: CFSv2 forecasts thru private service provider

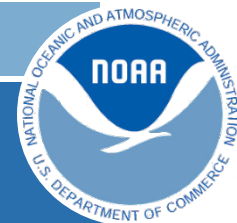


Examples of Future Climate Products by Societal Challenge

Where are we headed in the next 1-2 years?

Climate Impacts on Water Resources

- Improve forecast reliability for droughts and floods (onset, duration, severity) recognizing the influence of decadal and longer term forcings.
- Diagnose the role of precipitation events and land surface conditions in amplifying or reducing the severity of drought and flood impacts.
- Develop timely, accessible communication tools and impacts assessments (to support water, food, energy security and disaster risk reduction)
- Employ existing cross-sectoral (interagency, state, private and tribal) partnerships to improve coordination for prioritizing and advancing monitoring, forecasts and impacts assessment from watersheds to coast

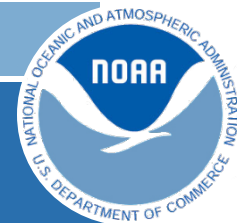


Examples of Future Climate Products by Societal Challenge

Where are we headed in the next 1-2 years?

Changes in Extremes of Weather & Climate

- Prioritize user needs against NOAA's expertise and identify focused improvements in science-based decision support products and services.
- Develop visualizations and data products that convey changes in weather and climate extremes, and a monitoring strategy that ensures continuity of observations for key extremes needed to inform risk management.
- Deliver improved predictions and projections services by establishing reliable estimates of confidence, ensuring access for use in risk modeling frameworks, and improving skill by advancing understanding of weather and climate extremes.
- Enhance access to, and understanding of, credible and current state of knowledge about extreme weather and climate events for key audiences.

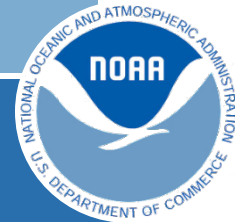


Examples of Future Climate Products by Societal Challenge

Where are we headed in the next 1-2 years?

Coasts and Climate Resilience

- Measure the total water level from all sources.
- Easily accessible total water level-related information.
- Broaden understanding of climate and coastal inundation-related hazards vulnerability, and synopses of the current state of knowledge.
- Predict or forecast total water level from all sources, including local to regional differences in the rate of change of total water level from coastal inundation.
- Create products that allow decision makers to visualize the potential impacts from coastal inundation across time scales.

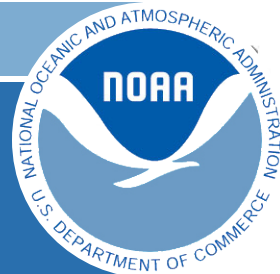


Examples of Future Climate Products by Societal Challenge

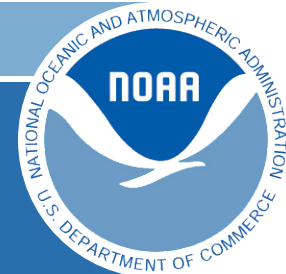
Where are we headed in the next 1-2 years?

Sustainability of Marine Ecosystems

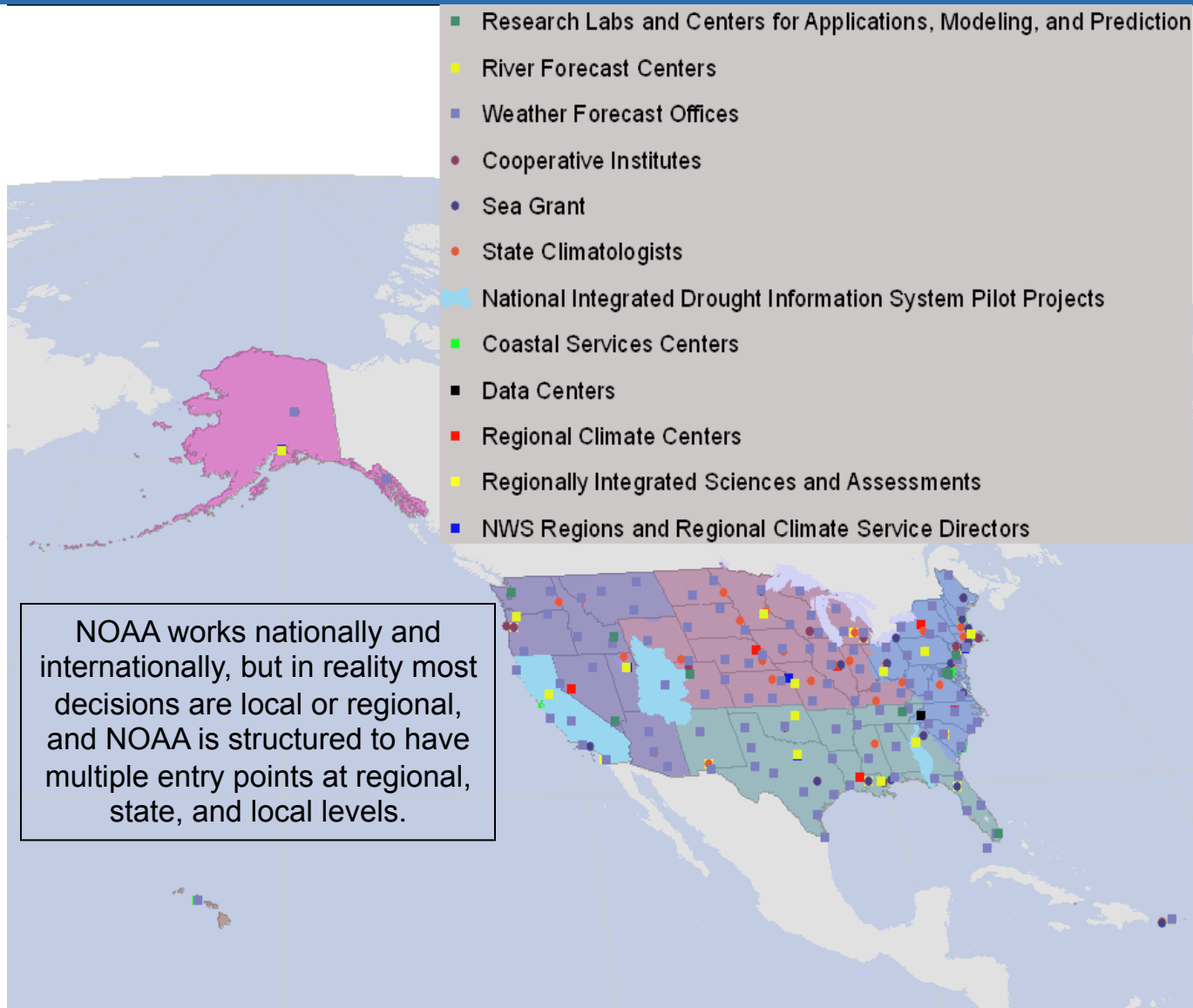
- Regional information on past changes in climate and ocean conditions.
- Regional assessments of past climate-related impacts on living marine resources (What has changed?).
- Seasonal forecasts of regional climate and ocean conditions (Early warnings, outlooks etc...).
- Coupled projections of future climate - ocean - marine resource conditions (decadal to multi-decadal scales).
- Assessments of risks and impacts for use in management decisions (fisheries, protected species, protected areas etc).



Extras



NOAA Climate Presence





Regional Climate Prediction Information

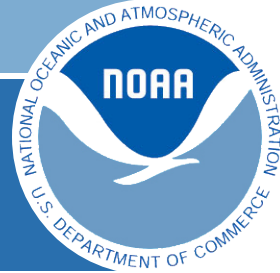
- The CPC official outlook products are primarily national in scope (broad scale conditions).
- Users of CPC climate outlooks typically want information at higher spatial (and temporal) resolution targeted to their needs for decision making and risk management.
- Many key science issues must be addressed to establish a framework for regional climate prediction information:

Identifying and fully exploiting sources of predictability.

Understanding predictability of regional climate anomalies.

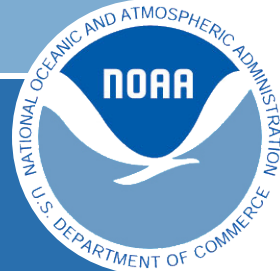
Reducing uncertainties in forecasts at specific locations.

Predicting regional and local impacts of weather and climate variations .



Regional Climate Information: Current Opportunities & Activities

1. Facilitate the use of existing climate information at the regional scale.
 - Develop regional impacts, outlooks and verification (e.g. CPC-NCDC-RCSD's)
 - Enhance CPC-RISA program to provide regional climate forecast products and applications
 - Enhance coordination between national centers, regions and field (e.g. CPC-NWS WFO's)
2. Evaluate scientific basis for downscaled climate model information
 - Evaluate high resolution global models (e.g. NMME) –vs– downscaling for operational products (e.g. CPO-NCEP)
3. Promote sustained engagement at the intersection between climate science and decision making for regional climate information
 - National Climate Predictions and Projections (NCPP) Platform
 - Regional Pilots



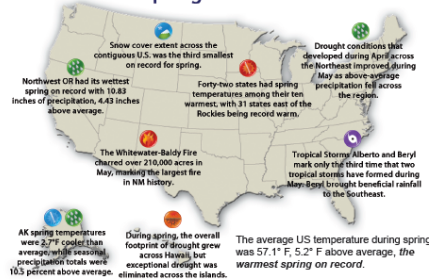
Regional Impacts & Outlooks

Quarterly Climate Impacts and Outlook

Western Region Spring 2012

National - Significant Events for March - May 2012

Significant Events for May and Spring 2012



Highlights for the West

Mountain snowpack in the Northwest continued to increase due to below-average temperatures and above-average precipitation.

Sub-par mountain snowpack in the Southwest rapidly disappeared in response to exceptional warmth and lack of moisture.

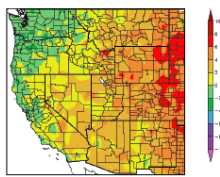
Critical fire conditions (low relative humidity, high wind, drought conditions) persisted across much of the Southwest, allowing wildfires to develop and spread rapidly.

Southwest winds in excess of 50 mph drove a dust storm into the Four Corners region which combined with wildfire smoke to reduce regional visibility and air quality.

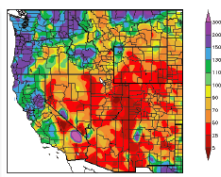
Equatorial Pacific sea surface conditions have transitioned from La Niña to ENSO-neutral conditions. These conditions are expected to continue through the summer.

Regional - Climate Overview for March - May 2012

Temperature and Precipitation Anomalies

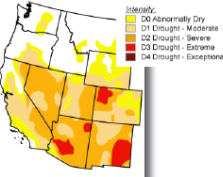


Departure from Normal Temperature (F)
3/1/2012 - 5/31/2012



Percent of Normal Precipitation (%)
3/1/2012 - 5/31/2012

Drought in the West



US Drought Monitor
6/5/2012

The temperature anomalies shown in the left panel indicate that most of the interior West had above-normal temperatures (warm colors), with slightly cooler-than-normal temperatures in the Northwest and the northern and central California coastal region.

The Pacific Northwest and much of California had well above-normal precipitation, while most of the interior West received much less precipitation than normal. Oregon had the wettest spring in the last 118 years and Washington had the third wettest. (Provisional temperature and precipitation data courtesy of the High Plains Regional Climate Center, www.hprcc.unl.edu.)

The US Drought Monitor shows abnormally dry to extreme drought conditions in many parts of the West. (The Drought Monitor is a collaborative product from the USDA, NOAA and National Drought Mitigation Center, www.droughtmonitor.unl.edu/monitor.html.)

Contact: Robert Webb (Robert.S.Webb@noaa.gov)

Western Region Quarterly Climate Impacts and Outlook | June 2012

Roles of Regional Climate Service Directors:

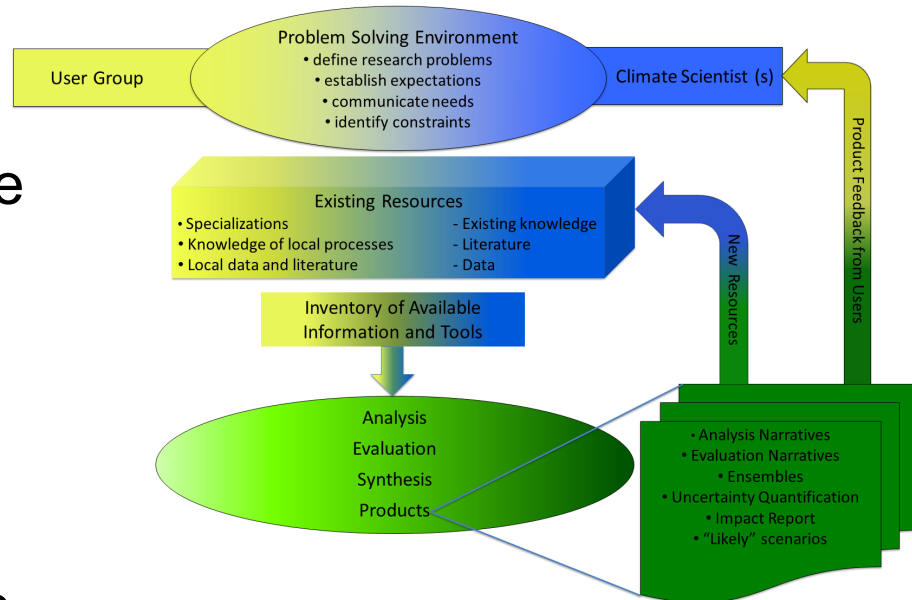
- Lead cross line office coordination of NOAA's regional climate services activities
- Partner with other federal agencies at a regional scale
- Promote shared understanding between and among info providers and users
- Organize liaisons to regional, state, and local organizations using NOAA climate services



One Pathway: National Climate Predictions and Projections (NCPP) Platform

Mission: Supports state-of-the-art approaches to develop and deliver comprehensive regional climate information and facilitate its use in decision making and adaptation planning.

Strategy: A community enterprise where climate information users, infrastructure developers, and scientists come together in a collaborative problem solving environment.



[More on Mission and Strategy](#)

[NCPP Flyer and Brochure](#)



NCPP Approach to Mission

NCPP is focused on the application of climate models to the development of structured approaches to climate problem solving.

NCPP

- links existing capabilities and communities.
- integrates cyberinfrastructure, quantitative evaluation of climate predictions, & narratives of direct use to practitioners.
- leverages open communities and open source development.
- is a governed community



Pilot Projects:

Missouri River Basin / La Nina (2011-12)

[Missouri River Basin / La Nina](#)

([Accomp. July 2012](#))

- How do we do this sort of work?
 - What steps?
 - What information?
- Document: Next project does not start from zero
- Footprint: Re-use for next project

- Defining and maintaining stakeholder networks
- Linking national predictions to regional applications in real-world situation
- Relating seasonal and long-term products
- Developing templates for next generation of information ([template example](#))
- Defining end-to-end work flow for project
- Evaluating information delivery

Lessons: Barriers to Community. Networks of Content Providers. ([Resources Presented](#))



Pilot Projects: Evaluation of Downscaling (2012-13)

[Evaluation
Methodology](#)
([Downscaling 2013](#))
([Accomp 2012](#))

- With Climate Science Applications Team developing
 - Protocols
 - Metrics
 - “EOS” Paper
- Developing standard language to describe statistical and dynamical downscaling

- 2013 Downscaling Workshop is an integrated NCPP delivery
- Define process to advance standardization of evaluation of downscaled data
- Cyberinfrastructure, tools, and services to support community evaluation, documentation, and communication.
- Development of controlled vocabulary for description and evaluation of downscaled data
- Building and sustaining community ([values](#))